



6712-01

FEDERAL COMMUNICATIONS COMMISSION

47 CFR Part 15

[ET Docket No. 10-23; FCC 12-34]

Tank Level Probing Radars

AGENCY: Federal Communications Commission.

ACTION: Proposed rule.

SUMMARY: This document proposes to expand the scope of this proceeding to propose a set of technical rules for the operation of unlicensed level probing radars (LPR) in several frequency bands. LPR devices are low-power radars that measure the level (relative height) of various substances in man-made or natural containments. In open-air environments, LPR devices may be used to measure levels of materials such as coal piles or water basin levels. An LPR device also may be installed inside an enclosure, *e.g.*, a tank made of materials such as steel or fiberglass and commonly referred to as a tank level probing radar (TLPR) that could be filled with liquids or granulates. During the pendency of the rulemaking proceeding, but outside this proceeding, the Commission received waiver requests and other inquiries regarding outdoor use on additional frequencies under existing rules for unlicensed devices. To address the apparent need for a comprehensive and consistent approach to LPR devices, the Commission is proposing in this FNPRM rules that would apply to the operation of LPR devices installed in both open-air environments and inside storage tanks in the following frequency bands: 5.925-7.250 GHz, 24.05-29.00 GHz, and 75-85 GHz.

DATES: Comments must be filed on or before **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**, and reply comments must be filed on or before **[INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**.

FOR FURTHER INFORMATION CONTACT: Anh Wride, Office of Engineering and Technology, (202) 418-0577, e-mail: Anh.Wride@fcc.gov, TTY (202) 418-2989.

ADDRESSES: You may submit comments, identified by [docket number and/or rulemaking number], by any of the following methods:

- Federal Communications Commission's Web Site: <http://fjallfoss.fcc.gov/ecfs2/>. Follow the instructions for submitting comments.
- Mail: Anh Wride, Office of Engineering and Technology, Room 7-A363, Federal Communications Commission, 445 12th SW, Washington, DC 20554.
- People with Disabilities: Contact the FCC to request reasonable accommodations (accessible format documents, sign language interpreters, CART, etc.) by e-mail: FCC504@fcc.gov or phone: 202-418-0530 or TTY: 202-418-0432.

For detailed instructions for submitting comments and additional information on the rulemaking process, see the SUPPLEMENTARY INFORMATION section of this document.

SUPPLEMENTARY INFORMATION: This is a summary of the Commission's Further Notice of Proposed Rule Making, ET Docket No. 10-23, FCC 12-34, adopted March 26, 2012, and released March 27, 2012. The full text of this document is available for inspection and copying during normal business hours in the FCC Reference Center (Room CY-A257), 445 12th Street, SW., Washington, DC 20554. The complete text of this document also may be purchased from the Commission's copy contractor, Best Copy and Printing, Inc., 445 12th Street, SW., Room, CY-B402, Washington, DC 20554. The full text may also be downloaded at: www.fcc.gov.

Pursuant to sections 1.415 and 1.419 of the Commission's rules, 47 CFR §§ 1.415, 1.419, interested parties may file comments and reply comments on or before the dates indicated on the first page of this document. Comments may be filed using the Commission's Electronic Comment Filing System (ECFS). See Electronic Filing of Documents in Rulemaking Proceedings, 63 FR 24121 (1998).

- Electronic Filers: Comments may be filed electronically using the Internet by accessing the ECFS: <http://fjallfoss.fcc.gov/ecfs2/>.
- Paper Filers: Parties who choose to file by paper must file an original and one copy of each filing. If more than one docket or rulemaking number appears in the caption of this proceeding, filers must submit two additional copies for each additional docket or rulemaking number.

Filings can be sent by hand or messenger delivery, by commercial overnight courier, or by first-class or overnight U.S. Postal Service mail. All filings must be addressed to the Commission's Secretary, Office of the Secretary, Federal Communications Commission.

- All hand-delivered or messenger-delivered paper filings for the Commission's Secretary must be delivered to FCC Headquarters at 445 12th St., SW, Room TW-A325, Washington, DC 20554. The filing hours are 8:00 a.m. to 7:00 p.m. All hand deliveries must be held together with rubber bands or fasteners. Any envelopes and boxes must be disposed of before entering the building.
- Commercial overnight mail (other than U.S. Postal Service Express Mail and Priority Mail) must be sent to 9300 East Hampton Drive, Capitol Heights, MD 20743.
- U.S. Postal Service first-class, Express, and Priority mail must be addressed to 445 12th Street, SW, Washington DC 20554.

People with Disabilities: To request materials in accessible formats for people with disabilities (braille, large print, electronic files, audio format), send an e-mail to fcc504@fcc.gov or call the Consumer & Governmental Affairs Bureau at 202-418-0530 (voice), 202-418-0432 (tty).

Summary of Further Notice of Proposed Rulemaking

1. In the Further Notice of Proposed Rule Making (FNPRM), the Commission expands the scope of this proceeding to propose a set of technical rules for the operation of unlicensed level probing radars (LPR) in several frequency bands. LPR devices are

low-power radars that measure the level (relative height) of various substances in man-made or natural containments. In open-air environments, LPR devices may be used to measure levels of materials such as coal piles or water basin levels. An LPR device also may be installed inside an enclosure, e.g., a tank made of materials such as steel or fiberglass and commonly referred to as a tank level probing radar (TLPR) that could be filled with liquids or granulates. In the Notice of Proposed Rule Making and Order (Notice and Order), 75 FR 9850, March 4, 2010, in this proceeding, the Commission proposed rules applicable only to TLPR devices for operation in the 77-81 GHz band inside steel and concrete tanks, as that was the use requested by the initial proponents. During the pendency of the rulemaking proceeding, but outside this proceeding, the Commission received waiver requests and other inquiries regarding outdoor use on additional frequencies under existing part 15 rules for unlicensed devices. To address the apparent need for a comprehensive and consistent approach to LPR devices, the Commission proposed in this FNPRM rules that would apply to the operation of LPR devices installed in both open-air environments and inside storage tanks in the following frequency bands: 5.925-7.250 GHz, 24.05-29.00 GHz, and 75-85 GHz.

2. LPR devices can provide accurate and reliable target resolution to identify water levels in rivers and dams or critical levels of materials such as fuel, sewer-treated waste, and high risk substances, reducing overflow and spillage and minimizing exposure of maintenance personnel in the case of high risk materials. The Commission is proposing a set of rules that would be applicable to LPR devices (including TLPR devices) that would allow the expanded development of a variety of radar level-measuring products that will benefit the public and industry and improve the accuracy and reliability of these measuring tools beyond that which is permitted under our current part 15 rules. To the extent practicable, these proposals would also harmonize our technical rules for LPR devices with similar European standards in an effort to improve the competitiveness of U.S. manufacturers in the global economy. The Commission believes that, with appropriate rules, LPR devices can operate on

an unlicensed basis in the proposed frequency bands without causing harmful interference to authorized services.

3. On January 14, 2010, the Commission adopted the Notice and Order in this proceeding in response to: (1) a Petition for Rulemaking from Siemens Milltronics Process Instruments Inc. (Siemens) requesting that the Commission amend its rules to allow TLPR devices to operate in the “restricted” 77-81 GHz frequency band inside steel or concrete tank enclosures; (2) a concurrent request for waiver, also by Siemens, of §15.205(a) to allow TLPR operation in the 78-79 GHz frequency band, subject to certain conditions; and (3) a similar request for waiver by Ohmart/VEGA Corporation (Ohmart/VEGA) to allow TLPR operation in the 77-81 GHz band. The Notice and Order proposed to modify part 15 of the rules to allow the 77-81 GHz frequency band to be used on an unlicensed basis for the operation of LPR equipment installed inside closed storage tanks made of metal, concrete, or other material with similar attenuating characteristics and also sought comment on whether to allow TLPR operation on an unlicensed basis in the 75-85 GHz band. The Notice and Order also sought comment on whether the Commission should allow installation of TLPR devices in tanks made of materials with a lower attenuation coefficient than steel/concrete, including open-air installations, and requested input on additional measures to ensure that TLPR devices installed in such enclosures comply with the radiated emissions limit outside the tank. No comments were received in opposition to the specific proposals set forth in the Notice and Order, but no comments were received regarding open-air installations or other containers. The Order granted waivers of the restriction on spurious emissions in the 77-81 GHz band set forth in §15.205(a) to Siemens, Ohmart/VEGA, and any other responsible party that meets the specified waiver conditions, to permit TLPR devices to be installed inside tanks with high attenuation characteristics, e.g., steel or concrete, pending the conclusion of the concurrently initiated rulemaking.

4. To date, the Commission has authorized LPR devices primarily for use in tanks upon demonstration of compliance with §15.209 of the rules, which specifies an average EIRP limit of -41.3 dBm for operations above 960 MHz. In addition, §15.35(b) of the rules sets a peak limit at 20 dB above the average limit, e.g., a peak EIRP limit of -21.3 dBm. For pulsed signals, it may be necessary to take into account the limitations of the measurement instrumentation to determine the total peak power level, through the use of a pulse desensitization correction factor (PDCF), which is an adjustment factor that must be added to the indicated value of a pulsed emission on a spectrum analyzer when the emission bandwidth of the pulse exceeds the resolution bandwidth of the analyzer. Therefore, pulsed LPR devices often must reduce their peak power output to comply with the peak emission limit in §15.209 and thus may sacrifice the necessary precision and accuracy required in many applications. LPR devices using other modulation techniques, *e.g.*, FMCW, also need wider bandwidth in certain frequency ranges to achieve the necessary measurement precision.

5. On January 26, 2010, the Commission placed on public notice a request for waiver of § 15.252(a) of the Commission's rules filed by Ohmart/VEGA to permit certification of LPR devices installed at fixed locations at outdoor sites as well as inside storage tanks in the 24.6-27 GHz frequency band. On January 3, 2011, the Commission also received a request for waiver of the frequency band restrictions of §15.250 from Sutron Corporation to operate its water level probing radar in the 5.460-7.250 GHz frequency band with fixed outdoor infrastructure. Because these waiver requests raise issues that are, in part, similar to those raised in this FNPRM, we are holding these two requests in abeyance pending final action in this rulemaking proceeding.

6. In the FNPRM, the Commission proposes a set of rules that would be applicable to LPR devices used in any RF level-measuring application, whether in an open-air environment or inside an enclosure, to address the needs for a comprehensive and consistent approach to LPR devices. These proposals are intended to allow for the introduction of more diverse

applications of LPRs in several frequency bands and improve the accuracy and reliability of these level-measuring tools beyond what is permitted under our current part 15 rules. The Commission also believes that the proposed rules will help to simplify equipment development and certification of LPR devices as well as provide a simplified method for measuring the radiated emissions from these devices.

7. The Commission has previously authorized LPR devices primarily for use in tanks upon demonstration of compliance with §15.209 of the rules, which specifies an average EIRP limit of -41.3 dBm for operations above 960 MHz. In addition, these devices have also been required to demonstrate that they comply with §15.35(b) of the rules, which sets a peak limit at 20 dB above the average limit, e.g., a peak EIRP limit of -21.3 dBm. Pulsed LPR devices often must reduce their peak power output in order to comply with this peak emission limit and thus may sacrifice the necessary precision and accuracy required by many applications. LPR devices using other modulation techniques, e.g., FMCW, also need wider bandwidth in certain frequency ranges to achieve the necessary measurement precision. LPR devices need higher power and wider bandwidth than permitted under §15.209 of the rules to fully achieve the potential of RF level-measuring technology. In addition, the part 15 rules for similar wide-band devices such as §§15.250 or 15.252 contain frequency and operational restrictions which preclude the certification of LPR devices absent a waiver.

8. In expanding the scope of this rulemaking proceeding, the Commission is responding to an industry-wide need to employ wider bandwidth and higher power to implement more diverse applications in RF level-measuring while maintaining or improving accuracy and reliability. Specifically, it proposes to amend part 15 to provide a set of new rules to govern specifically the operation of LPR devices installed both in open-air environments and inside storage tanks (TLPR applications) in the following frequency bands: 5.925-7.250 GHz, 24.05-29.00 GHz, and 75-85 GHz. To permit LPR operation in the 75-85 GHz band, the Commission also proposes to modify existing §15.205 of the rules to

remove the prohibition on intentional emissions in this band. The Commission further proposes to treat LPR and TLPR devices the same with respect to emission limits and frequency bands of operation without any additional installation limitations. That is, a level measuring radar that complies with our proposed rules would be able to be used in any application, whether outdoors in the open or inside any type of enclosure. Accordingly, the proposals for emission limits in this FNPRM would supersede the emission limit proposals for TLPR devices in the Notice and Order.

9. The Commission is proposing emission limits for the main-beam emissions which are based on the ETSI LPR Technical Standard and take into account the fact that there may be no additional attenuation provided by a tank enclosure. The proposed limits would allow the main-beam emissions from LPRs to be higher in power than is allowed under the general emission limits in §15.209. However, the levels of reflected emissions are not expected to exceed those general emission limits, and therefore no increased potential for interference is expected. The Commission also proposes to require that all spurious/unwanted emission limits from LPRs not exceed the general emission limits in §15.209 when measured in the main beam of a device's transmit antenna; the measurement procedure would also utilize elevation and azimuth measurement scans to determine the location at which these unwanted emissions are maximized. To further protect authorized services operating in the same and adjacent frequency bands, the Commission proposes to: (1) require the LPR antenna to be dedicated or integrated as part of the transmitter and professionally installed in a downward position; (2) limit installations of LPR devices to fixed locations; and (3) prohibit hand-held applications of LPR and the marketing of LPR devices to residential consumers.

10. The Commission based these proposals on the various waiver and informal rule interpretation requests it has received, and the emission limits adopted in Europe for LPR devices. Although our proposals would generally harmonize our rules with the European

LPR regulations with respect to the limits for fundamental emissions, they also would address the specific spectrum needs and restrictions in the U.S.

11. Frequency Bands of Operation. The Commission proposes to allow LPR operation under the new technical rules in the following frequency bands: 5.925-7.250 GHz, 24.05-29.00 GHz, and 75-85 GHz. In the Notice and Order, it proposed rules for TLPR devices in the 77-81 GHz band; in this FNPRM the Commission proposes to expand the frequency bands for LPR operation under the new rules for both in-tank and in open-air environments to include the 75-85 GHz band. It seeks comment on our proposals for LPR operation in each of the frequency bands discussed.

12. The Commission believes, that allowing LPR devices to operate under the technical rules it proposed herein will not increase the likelihood of harmful interference to incumbent authorized radiofrequency operations. LPR devices are typically installed at fixed industrial sites, such as quarries, paper mills, and ore refineries, or at facilities adjacent to bodies of water, such as dams, storm water lift stations, and sewage treatment plants, all of which are generally well away from residences. The Commission also proposed requiring LPR devices to utilize narrow beamwidth transmit antennas focused in a downward orientation. This will serve to minimize the likelihood of interference to any incumbent spectrum operations within proximity of a fixed LPR system. Finally, the emission limits proposed herein for LPR devices will ensure that incumbent operations are afforded similar protection as currently provided by the existing emission limits in §15.209 of the rules.

13. Currently, unlicensed wide-band transmitter operation within the 5.925-7.250 GHz band is permitted under §15.250 of our rules. In this band, licensed uses include non-Federal fixed, fixed satellite, and mobile services from 5.925 MHz to 7.125 MHz; and Federal fixed and space research services (deep space & Earth-to-space) from 7.125 MHz to 7.250 MHz. Part 15 transmitters operating in this band are prohibited from being used in toys or operating on board an aircraft or satellite. They cannot utilize a

fixed outdoor infrastructure, including outdoor-mounted transmit antennas, to establish a wide area communications network. The Commission believes that its proposal to adopt rules to permit LPR operation in the 5.925-7.250 GHz band, including permitting limited fixed outdoor installations, is consistent with the intent underlying the usage restrictions in §15.250. In this regard, LPRs will be single, i.e., relatively isolated, transmitters whose individual operations outdoors will not result in a dense deployment of transmitters.

14. Unlicensed wide-band operation in the 23.12-29.0 GHz band is permitted under § 15.252 of our rules. This band is shared between Federal and non-Federal services. Authorized licensed operations include radiolocation, EESS (active), amateur, fixed, inter-satellite, radionavigation, radiolocation satellite (Earth-to-space), fixed satellite (Earth-to-space), mobile, standard frequency and time signal satellite (Earth-to-space), space research (space-to-Earth), and EESS (space-to-Earth) services. Currently, unlicensed transmitters operating in this band must be mounted on vehicles and cannot be used in aviation applications. To provide expanded flexibility for optimizing LPR applications and to enhance global marketing opportunities by more closely harmonizing with ETSI in this frequency range, the Commission proposes to permit LPR operation in the 24.05-29.00 GHz band. The proposed frequency band is wider than that which ETSI has adopted; however, the Commission believes that the risk of interference to incumbent authorized services from LPR devices will be no greater than it is from existing part 15 radars currently operating in this band because LPR devices operate in a fixed downward-looking position.

15. Apart from a few exceptions, all spectrum above 38.6 GHz, including the 75-85 GHz band, is designated by footnote as a “restricted band” in §15.205 of the rules. Consequently, unless expressly permitted by rule or waiver, unlicensed devices are not allowed to intentionally radiate energy into a restricted band in order to protect sensitive radio services from harmful interference. The Commission has permitted unlicensed operation

within specific frequency bands above 38.6 GHz, e.g., 46.7-46.9 GHz, 57-64 GHz, 76-77 GHz, and 92-95 GHz.

16. The 75-85 GHz band is shared between Federal and non-Federal services. Authorized operations in this band currently include radio astronomy, fixed/mobile/fixed satellite, mobile satellite, broadcast and broadcast satellite, radiolocation, space research (space-to-Earth), amateur and amateur satellite services. In addition, unlicensed vehicular radars are currently permitted to operate in the 76-77 GHz band. The services in this band typically employ highly directional antennas to overcome the relatively higher propagation loss that occurs at these frequencies. In the Notice and Order, the Commission proposed to allow TLPR operation in the 77-81 GHz band and also sought comment on whether it should permit TLPR devices to operate in the broader 75-85 GHz band. No objections were received from incumbent service operators with respect to TLPR operation in the 75-85 GHz band in response to the Notice and Order. The Commission believes that an extension of the frequency range to allow LPR operation in the 75-85 GHz band will not adversely affect incumbent authorized users, because this band is currently sparsely used and the propagation losses are significant at these frequencies, making harmful interference unlikely beyond a short distance from the LPR device. The Commission seeks comment on this proposal.

17. Radiated Emission Limits. The Commission proposes to adopt radiated emission limits for LPR devices operating in each of the proposed frequency bands as set forth in the table below. These limits are consistent with those adopted by ETSI. ETSI derived its emission limits for main-beam emissions by mathematically correlating the reflected emissions from an LPR with the existing part 15 average emission limit for devices operating above 960 MHz. The proposed emission limits therefore would maintain the existing level of interference protection to incumbent radio services. The Commission also believes that harmonization of our limits with the ETSI limits is desirable because it could serve to expand global marketing opportunities for U.S. manufacturers.

Frequency Band (GHz)	Average Emission Limit (EIRP in dBm/MHz) as measured boresight (Note 2)	Peak Emission Limit (EIRP in dBm measured in 50 MHz) as measured boresight (Note 2)	Equivalent Average Reflected Emissions if measured <u>in situ</u> (EIRP in dBm/MHz) (Note 3)
5.925-7.250	-33	+7	-55
24.05-29.00	-14	+26	-41.3
75-85	-3	+34	-41.3

Notes: 1. Minimum bandwidth at the -10 dB points is 50 megahertz.

2. All emission limits defined herein are based on boresight measurements (*i.e.*, measurements performed within the main beam of an LPR antenna).

3. Equivalent reflected emissions include antenna back-lobe and side-lobe emissions and worst-case reflections from material being measured.

18. ETSI/ECC based these limits on the results of mathematical modeling which was supported by measurement data. ETSI/ECC's modeling effort shows that if the LPR complies with the main-beam (boresight) emission limits specified in the second and third columns of the table above, any reflected emissions, including antenna back-lobe or side-lobe emissions and worst-case reflections from the target material, will also comply with the existing average emission limit specified in §15.209 for devices operating above 960 MHz, shown in the table's fourth column. The main-beam emission limits vary with frequency band because the mathematical models accounted for the frequency-dependent propagation loss characteristics associated with each band. The Commission seeks comment on these proposed emission limits.

19. The Commission believes that the proposed LPR emission limits as measured in the main beam of the LPR antenna will adequately protect against harmful interference to incumbent authorized services in any of the proposed frequency bands, based on several factors. First, LPR devices will be required to utilize downward-focused narrow-beam transmit antennas, which are also needed to optimize level-measuring performance. Therefore, the only LPR emissions likely to be incident on an incumbent receiver within proximity will be reflected from the target material and thus significantly attenuated. Second, the proposed LPR emission limits are consistent with the results expected from application of the existing limits in radiated in situ measurements and therefore will maintain the existing level of protection afforded to incumbent authorized services. Third, as the operating frequency increases, the propagation path loss also increases as a result of the increased attenuating effects on radio waves from intervening objects and atmospheric conditions. Finally, the Commission is proposing certain operational conditions that would further reduce the likelihood of harmful interference to authorized services. Accordingly, it concludes that LPR devices will be able to share spectrum with incumbent authorized services in the proposed bands at the proposed emission limits. The Commission seeks comment on this tentative conclusion.

20. In the Notice and Order, for TLPR devices operating in the 77-81 GHz band in tanks with very high RF attenuation characteristics, e.g., steel or concrete, the Commission proposed an emission limit of +43 dBm on the transmitter's peak EIRP and +23 dBm on the transmitter's average EIRP levels for fundamental emissions when measured in a laboratory setting, *i.e.*, not installed in a tank. It also proposed to limit the radiated emissions from the TLPR device, when installed in representative tanks of each material type for testing in situ, to the general radiated emission limits for intentional radiators in §15.209(a) of its rules when measured outside of the TLPR tank enclosure in any direction. The Commission stated that emissions outside of the tank will likely be minimal when considering the tank enclosure's

attenuation coefficient in addition to the absorption characteristics of the target material (liquid or solid), and thus, any reflected signal will be mostly contained within the tank. The Commission also noted that in situ testing would require performance of compliance tests on a tank of each material type intended for use with the LPR at three representative installation sites (e.g., a metallic tank at three representative installation sites, a concrete tank at three representative installation sites), which could prove quite burdensome to an applicant.

21. The Commission is now proposing to treat TLPR devices in the same manner as LPR devices with respect to both emission limits and frequency bands of operation. Thus, if an LPR complies with these proposed rules, it can be installed inside an enclosure or out in the open since the proposed emission limits do not assume any additional attenuation provided by a tank enclosure. Although the emission limits proposed herein are somewhat lower than the TLPR limits previously-proposed (e.g., +34 dBm peak EIRP vs. +43 dBm peak EIRP, respectively), the Commission notes that the proposed limits do not assume any tank enclosure attenuation. It believes that this will alleviate the burdens involved in performing in situ compliance testing. These proposals also will permit TLPR devices to be used with a variety of tank materials, potentially increasing the useful applications of the technology. Accordingly, the Commission is proposing a definition for LPR devices that would encompass open-air and in-tank applications. The Commission seeks comment on these proposals.

22. Antenna Beamwidth. The Commission notes that the ECC recommendations are based on modeling results that assume the LPR antenna beamwidth is limited to less than 12 degrees for frequencies below 57 GHz and less than 8 degrees in the 75-85 GHz bands. It also notes that maintaining a narrow antenna beamwidth is also a performance criterion for optimizing LPR operations because a narrower beam reduces false echoes from objects other than the desired target material. The Commission proposes to adopt these antenna beamwidth requirements and seek comment on this proposal.

23. Antenna Side Lobe Gain. In assessing compatibility between LPR devices and systems operating in other radio services, the ETSI/ECC modeling effort assumed a maximum side lobe antenna gain of -10 dBi for off-axis angles from the main beam of greater than 60 degrees. In addition to the requirements for antenna beamwidth, the Commission seeks comment on the necessity of establishing limits on the gain of the antenna in the side lobe region and off-axis angle where the gain is to be defined.

24. Automatic Power Control. ECC also recommends the implementation of automatic power control (APC) with a dynamic range of 20 dB for LPRs. The Commission notes that as a consequence of our proposed emission limits, all reflected emissions from the LPR device will be kept at or below the §15.209 general emission limits. Thus, as tentatively concluded, harmful interference to other spectrum users is not expected. Therefore, the Commission does not propose to adopt APC requirements for LPR devices. Any party advocating a requirement for APC should provide technical analyses as to why the emission limit in §15.209 is not adequate.

25. Compliance Measurement. As stated, a primary reason for ECC adoption of a main-beam emission limit for LPR devices is to reduce the difficulties associated with measuring reflected emissions from an LPR device in situ. The Commission also notes, in concurrence with ETSI/ECC, that the current compliance practice of measuring reflected radiated emissions at a 3-meter horizontal distance from the radiating source while varying the measurement antenna height from 1 meter to 4 meters often does not yield repeatable results when LPR emissions are measured in situ. This is because the patterns of reflected emissions tend to vary and are therefore difficult to measure consistently, propagation losses in the higher frequency bands are significant, and it is not always practical to create a test bed that is representative of all of the substances that an LPR will measure, making it difficult to determine the worst-case reflectivity factor. In addition, the current measurement procedure does not consider any potential emissions that may radiate from the top of an LPR device.

The limits proposed herein will account for such emissions that could be missed entirely when applying the existing in situ compliance measurement procedures. With a main-beam emission limit, emissions are to be evaluated with the measurement antenna pointed directly at the LPR antenna, and as long the LPR complies with this limit, its reflected emissions in any direction will generally not exceed the existing average emission limit in §15.209, thereby maintaining the same level of interference protection to incumbent authorized users. The Commission tentatively concludes that the main-beam emission limit will facilitate representative, reliable, and repeatable emission measurements of the emissions from LPR devices. The Commission seeks comment on this tentative conclusion.

26. Based on our experience to date with compliance measurements of and the proposals herein for main-beam emission limits for LPR devices, the Commission seek comment on the following compliance measurement procedures. The Commission's Office of Engineering and Technology may publish specific information on how to conduct compliance testing following these procedures, e.g., by publication in a guidance document or as specified in the rules.

- Radiated measurements of the fundamental emission bandwidth and power shall be made with maximum main beam coupling between the LPR and test antennas (boresight).
- Measurements of the unwanted emissions radiating from an LPR shall be made utilizing elevation and azimuth scans to determine the location at which the emissions are maximized.
- All emissions at and below 960 MHz shall be measured with a CISPR quasi-peak detector.

- The fundamental emission bandwidth measurement shall be made using a peak detector with a resolution bandwidth of 1 MHz and a video bandwidth of at least 3 MHz.
- The provisions in §15.35(b) and (c) that limit the peak power to 20 dB above the average limit and require emissions to be averaged over a 100 millisecond period do not apply to devices operating under this section.
- Compliance measurements of frequency-agile LPR devices shall be performed with any related frequency sweep, step, or hop function activated.

27. Operational and Marketing Restrictions. The Commission proposes to adopt operational restrictions to require the antenna of an LPR device to be dedicated or integrated as part of the transmitter and professionally installed in a downward position; to limit installations of LPR devices to fixed locations; to prohibit hand-held applications of LPR devices; and to prohibit the marketing of LPR devices to residential consumers. The Commission proposes these restrictions to protect incumbent authorized services operating in the same and adjacent frequency bands from harmful interference. It seeks comment on these proposals.

28. Equipment Certification. In the Notice and Order, the Commission proposed to require that TLPR devices designed to operate in the 77-81 GHz band be approved under the Commission's certification procedures and that certification be performed by the Commission's Laboratory rather than by Telecommunications Certification Bodies (TCB). The Commission noted that because a standard test procedure for LPR devices had not yet been devised for use at these frequencies, this requirement would give the Commission time to develop appropriate measurement guidelines for devices intended for operation in this frequency band. It observes, however, that the new proposals made herein will facilitate the direct measurement of emissions within the main beam of the LPR antenna and are consistent with compliance measurement methodologies currently used with other types of unlicensed

transmitters. The Commission therefore proposes to permit TCBs to certify LPR devices operating under these proposed rules. The Commission seeks further comment on this proposal.

29. The Commission is aware that some approvals of TLPRs have already been granted under § 15.209 of our rules. These devices may continue to operate under § 15.209 if their worst-case radiated emissions continue to comply with the limits in these rules. The Commission recognizes that a certified TLPR device could be approved to operate under other conditions, e.g., outdoor installations in open-air environments, in an enclosure with low RF attenuation characteristics, or with higher power. To allow previously-certified devices to take advantage of the changes proposed in this FNPRM, the Commission proposes to allow the responsible party to file for a permissive change request in accordance with the existing rules and practices, provided that: (1) the LPR device operates only within the frequency bands authorized by rules proposed herein; (2) measurement data taken in accordance with the measurement procedure proposed above is provided to demonstrate compliance with the new emission limits specified in these proposed rules; and (3) operational changes to the device are being implemented by software upgrade without any hardware change. The Commission seeks comment on this proposal.

30. Cost Benefit Analysis. The Commission believes that the benefits of the proposed regulations for manufacturers and users outweigh any potential costs. LPR devices need higher power and wider bandwidth than that which is permitted under the existing part 15 rules to fully achieve the potential of this measuring technology. The Commission's proposed rules would provide a necessary remedy for these devices to operate at the power levels and in the appropriate frequency bands required to deliver the needed accuracy for diverse applications, thereby promoting the expanded development and use of this technology to the benefit of businesses, consumers, and the economy. The proposed higher power levels in the proposed frequency bands would further the development of better and improved

level-measuring tools, but these changes would not increase the potential for interference to authorized users beyond what is permitted under the current rules. In addition, the proposed rules will help to simplify equipment development and certification of LPR devices, as well as provide a simplified method for measuring the radiated emissions from these devices. The Commission seeks comment on this analysis and any additional benefits that may result from these proposed rules. Parties that oppose these proposed rules should cite specific harms that they believe would result from changing the rules.

Initial Regulatory Flexibility Analysis

31. As required by the Regulatory Flexibility Act of 1980, as amended (RFA),¹ the Commission has prepared this present Initial Regulatory Flexibility Analysis (IRFA) of the possible significant economic impact on a substantial number of small entities by the policies and rules proposed in this Further Notice of Proposed Rule Making (FNPRM). Written public comments are requested on this IRFA. Comments must be identified as responses to the IRFA and must be filed by the deadlines for comments provided on the first page of this FNPRM. The Commission will send a copy of this FNPRM, including this IRFA, to the Chief Counsel for Advocacy of the Small Business Administration (SBA).²

A. Need for, and Objectives of, the Proposed Rules.

32. This rule making proposal is initiated to obtain comments regarding proposed changes to the regulations for radio frequency devices that do not require a license to operate. The Commission proposed to expand the scope of the above proceeding to adopt technical rules for operation of specific types of low-power transmitters called level probing radar (LPR) devices, including tank level probing radars (TLPR), on an unlicensed basis under the provisions of part 15 of the Commission's rules in the following frequency bands:

¹ See 5 U.S.C. 603. The RFA, see 5 U.S.C. 601 - 612, has been amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), Public Law No. 104-121, Title II, 110 Stat. 847 (1996).

² See 5 U.S.C. 603(a).

5.925-7.250 GHz, 24.05-29.00 GHz and 75-85 GHz. The Commission proposed to amend its part 15 rules to revise the original proposed §15.256 in the Notice of Proposed Rule Making and Order (Notice and Order) to permit the operation of LPR devices installed both outdoors in the open and inside storage tanks (TLPR) in the above frequency bands. The Commission propose to treat LPR and TLPR devices the same with respect to emission limits and frequency bands of operation without any additional installation limitation. That is, a level-measuring radar that complies with our proposed rules will be able to be used in any application, whether outdoors in the open or inside any type of enclosure, e.g., steel or plastic. These proposals will also extend the operation of TLPR devices from the originally proposed 77-81 GHz band to the additional proposed frequency bands, at the new proposed main-beam emission limits. The Commission proposes emission limits for fundamental emissions depending on the LPR frequency bands of operation, as measured in the antenna main beam, based on the LPR Technical Standards adopted in Europe, to promote savings for manufacturers that operate in the global economy. The Commission proposes to require that all spurious/unwanted emission limits not exceed the general emission limits in §15.209 when measured in the main beam of the LPR antenna, as well as utilizing elevation and azimuth scans to determine the location at which the emissions are maximized. To further protect authorized services operating in the same and adjacent frequency bands, we also propose to adopt operational restrictions to require the LPR antenna to be dedicated or integrated as part of the transmitter and professionally installed in a downward position; to limit installations of LPR devices to fixed locations; and to prohibit hand-held applications of LPR and the marketing of LPR devices to consumers. The Commission believes that its proposals herein would enable LPR devices that will provide better accuracy and reliability in target resolution to identify critical levels of materials such as fuel, water and sewer treated waste, and high-risk substances. The proposed amendments to our rules will permit these devices to operate effectively and reliably, reducing storage tank overfill and spilling and minimizing exposure

of maintenance personnel in the case of high-risk materials, all without increasing the risk of interference to authorized services.

B. Legal Basis.

33. The proposed action is taken pursuant to sections 1, 4(i), 302, 303(e), 303(f), 303(g), and 303(r) of the Communications Act of 1934, as amended, 47 U.S.C. 151, 154(i), 302, 303(e), 303(f), 303(g), and 303(r).

C. Description and Estimate of the Number of Small Entities to Which the Proposed Rules Will Apply.

34. The RFA directs agencies to provide a description of and, where feasible, an estimate of the number of small entities that may be affected by the proposed rules, if adopted.³ The RFA generally defines the term "small entity" as having the same meaning as the terms "small business," "small organization," and "small governmental jurisdiction."⁴ In addition, the term "small business" has the same meaning as the term "small business concern" under the Small Business Act.⁵ A small business concern is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the SBA.⁶

35. Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing. The Census Bureau defines this category as follows: "This industry comprises establishments primarily engaged in manufacturing radio and television broadcast and wireless communications equipment. Examples of products made by these establishments

³ 5 U.S.C. 603(b)(3).

⁴ 5 U.S.C. 601(6).

⁵ 5 U.S.C. 601(3) (incorporating by reference the definition of "small business concern" in 15 U.S.C. 632). Pursuant to the RFA, the statutory definition of a small business applies "unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the Federal Register." 5 U.S.C. 601(3).

⁶ Small Business Act, 15 U.S.C. 632 (1996).

are: transmitting and receiving antennas, cable television equipment, GPS equipment, pagers, cellular phones, mobile communications equipment, and radio and television studio and broadcasting equipment.”⁷ The SBA has developed a small business size standard for Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing, which is all such firms having 750 or fewer employees.⁸ According to Census Bureau data for 2002, there were a total of 1,041 establishments in this category that operated for the entire year.⁹ Of this total, 1,010 had fewer than 500 employees, and an additional 13 had between 500 and 999 employees.¹⁰ Thus, under this size standard, the majority of firms can be considered small.

36. Wireless Service Providers. The SBA has developed a small business size standard for wireless firms within the two broad economic census categories of "Paging"¹¹ and "Cellular and Other Wireless Telecommunications."¹² Under both categories, the SBA deems a wireless business to be small if it has 1,500 or fewer employees. For the census category of Paging, Census Bureau data for 2002 show that there were 807 firms in this

⁷ U.S. Census Bureau, 2002 NAICS Definitions, “334220 Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing”; <http://www.census.gov/epcd/naics02/def/NDEF334.HTM#N3342>.

⁸ 13 CFR 121.201, NAICS code 334220.

⁹ U.S. Census Bureau, American FactFinder, 2002 Economic Census, Industry Series, Industry Statistics by Employment Size, NAICS code 334220 (released May 26, 2005); <http://factfinder.census.gov>. The number of “establishments” is a less helpful indicator of small business prevalence in this context than would be the number of “firms” or “companies,” because the latter takes into account the concept of common ownership or control. Any single physical location for an entity is an establishment, even though that location may be owned by a different establishment. Thus, the numbers given may reflect inflated numbers of businesses in this category, including the numbers of small businesses. In this category, the Census Bureau breaks-out data for firms or companies only to give the total number of such entities for 2002, which was 929.

¹⁰ Id. An additional 18 establishments had 1,000 or more employees.

¹¹ 13 CFR 121.201, NAICS code 517211.

¹² 13 CFR 121.201, NAICS code 517212.

category that operated for the entire year.¹³ Of this total, 804 firms had employment of 999 or fewer employees, and three firms had employment of 1,000 employees or more.¹⁴ Thus, under this category and associated small business size standard, the majority of firms can be considered small. For the census category of Cellular and Other Wireless Telecommunications, Census Bureau data for 2002 show that there were 1,397 firms in this category that operated for the entire year.¹⁵ Of this total, 1,378 firms had 999 or fewer employees, and 19 firms had 1,000 employees or more.¹⁶ Thus, under this second category and size standard, the majority of firms can, again, be considered small.

37. The Commission has proposed to reduce burdens wherever possible. Our proposals for new technical rules regarding LPR operation in the 5.925-7.250 GHz, 24.05-29.00 GHz, and 75-85 GHz would reduce burdens on small entities. LPR operation in these bands will increase the utilization of this spectrum by allowing a radio-frequency type of level-measuring technology to access the spectrum that is currently not used under the current technical rules for these types of industrial applications, resulting in more efficient use of these bands. Where possible we have made an effort to harmonize with international technical standards in Europe to promote cost savings for small manufacturers competing in the global economy. The Commission will continue to examine further alternatives with the objectives of eliminating unnecessary regulations and minimizing significant economic impact on small entities. The Commission seeks comment on significant alternatives commenters believe it should adopt.

¹³ U.S. Census Bureau, 2002 Economic Census, Subject Series: Information, “Establishment and Firm Size (Including Legal Form of Organization,” Table 5, NAICS code 517211 (issued Nov. 2005).

¹⁴ Id. The census data do not provide a more precise estimate of the number of firms that have 1,500 or fewer employees; the largest category provided is for firms with “1000 employees or more.”

¹⁵ U.S. Census Bureau, 2002 Economic Census, Subject Series: Information, “Establishment and Firm Size (Including Legal Form of Organization,” Table 5, NAICS code 517212 (issued Nov. 2005).

¹⁶ Id. The census data do not provide a more precise estimate of the number of firms that have 1,500 or fewer employees; the largest category provided is for firms with “1,000 employees or more.”

38. The Commission does expect that the rules proposed in this Further Notice of Proposed Rule Making will have a significant negative economic impact on small businesses.

D. Description of Projected Reporting, Recordkeeping, and Other Compliance Requirements.

39. Part 15 transmitters already are required to be authorized under the Commission's certification procedure as a prerequisite to marketing and importation. The reporting and recordkeeping requirements associated with these equipment authorizations would not be changed by the proposals contained in this FNPRM. The changes to the regulations would permit operation of unlicensed radar devices used in specific industrial applications at frequencies already used by other Part 15 devices and in a higher frequency band (75-85 GHz).

E. Federal Rules that May Duplicate, Overlap or Conflict with the Proposed Rules.

40. None.

Ordering Clauses

41. Pursuant to sections 1, 4(i), 302, 303(e), 303(f), 303(g), and 303(r) of the Communications Act of 1934, as amended, 47 U.S.C. Sections 151, 154(i), 302, 303(e), 303(f), 303(g), and 303(r), this Further Notice of Proposed Rule Making IS ADOPTED.

42. NOTICE IS HEREBY GIVEN of the proposed regulatory changes described in this Further Notice of Proposed Rulemaking, and that comment is sought on these proposals.

43. The Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of this Further Notice of Proposed Rule Making, including the Initial Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch,
Secretary,

For the reasons discussed in the preamble, the Federal Communications Commission proposes to amend 47 CFR part 15 to read as follows:

PART 15 – RADIO FREQUENCY DEVICES

1. The authority citation for part 15 continues to read as follows:

Authority: 47 U.S.C. 154, 202, 303, 304, 307 and 544A.

2. Section 15.3 is amended by adding paragraph (hh) to read as follows:

§ 15.3 Definitions.

* * * * *

(hh) Level Probing Radar (LPR): A short-range radar transmitter used in a wide range of applications to measure the amount of various substances, mostly liquids or granulates. LPR equipment may operate in open-air environments or inside an enclosure containing the substance being measured.

* * * * *

3. Section 15.31 is amended by revising paragraph (c) to read as follows:

§ 15.31 Measurement standards.

* * * * *

(c) Except as otherwise indicated in § 15.256, for swept frequency equipment, measurements shall be made with the frequency sweep stopped at those frequencies chosen for the measurements to be reported.

* * * * *

4. Section 15.35 is amended by revising paragraph (b) to read as follows:

§ 15.35 Measurement detector functions and bandwidths.

* * * * *

(b) Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average

detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz. When average radiated emission measurements are specified in this part, including average emission measurements below 1000 MHz, there also is a limit on the peak level of the radio frequency emissions. Unless otherwise specified, see, e.g., §§ 15.250, 15.252, 15.255, 15.256 and 15.509-15.519 of this part, the limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device, e.g., the total peak power level. Note that the use of a pulse desensitization correction factor may be needed to determine the total peak emission level. The instruction manual or application note for the measurement instrument should be consulted for determining pulse desensitization factors, as necessary.

* * * * *

5. Section 15.205 is amended by revising paragraph (d)(4) to read as follows:

§ 15.205 Restricted bands of operation.

* * * * *

(d) * * *

(4) Any equipment operated under the provisions of §§15.253, 15.255, 15.256 in the frequency band 75-85 GHz, or § 15.257 of this part.

* * * * *

6. Add §15.256 to read as follows:

§ 15.256 Operation of level probing radars within the bands 5.925-7.250 GHz, 24.05-29.00 GHz, and 75-85 GHz.

- (a) Operation under this section is limited to level probing radar (LPR) devices.
- (b) LPR devices operating under the provisions of this section shall utilize a dedicated or integrated transmit antenna, and the system shall be professionally installed and maintained to

ensure a downward orientation of the transmit antenna.

(c) LPR devices operating under the provisions of this section shall be installed only at fixed locations.

(d) Hand-held applications and marketing to residential consumers are prohibited.

(e) The fundamental bandwidth of an LPR emission is defined as the width of the signal between two points, one below and one above the center frequency, outside of which all emissions are attenuated by at least 10 dB relative to the maximum transmitter output power when measured in an equivalent resolution bandwidth.

(1) The minimum fundamental emission bandwidth shall be 50 MHz for LPR operation under the provisions of this section.

(2) LPR devices operating under this section must confine their fundamental emission bandwidth within the 5.925-7.250 GHz, 24.05-29.00 GHz, and 75-85 GHz bands under all conditions of operation.

(f) Fundamental Emissions Limits

(1) All emission limits provided in this section are expressed in terms of Equivalent Isotropic Radiated Power (EIRP).

(2) The EIRP level is to be determined from the maximum measured power within a specified bandwidth.

(i) The EIRP in 1 MHz is computed from the maximum power level measured within any 1-MHz bandwidth using a power averaging detector;

(ii) The EIRP in 50 MHz is computed from the maximum power level measured with a peak detector in a 50-MHz bandwidth centered on the frequency at which the maximum average power level is realized.

- (3) The EIRP limits for LPR operations in the bands authorized by this rule section are provided in the following table:

Frequency Band of Operation (GHz)	EIRP Limit in 1 MHz (dBm)	EIRP Limit in 50 MHz (dBm)
5.925-7.250	-33	7
24.05-29.00	-14	26
75-85	-3	34

(g) Unwanted Emissions Limits

- (1) All emission limits provided in this section are expressed in terms of Equivalent Isotropic Radiated Power (EIRP) and are computed based on the maximum average power level measured within any 1-MHz bandwidth.
- (2) Unwanted emission limits applicable to LPR devices shall not exceed the general emission limits in §15.209.

(h) Antenna Beamwidth

- (1) LPR devices operating under the provisions of this section within the 5.925-7.250 GHz and 24.05-29.00 GHz bands must use an antenna with a maximum half-power beamwidth of 12 degrees.
- (2) LPR devices operating under the provisions of this section within the 75-85 GHz band must use an antenna with a maximum half-power beamwidth of 8 degrees.

(i) Antenna Side Lobe Gain

- (1) LPR devices operating under the provisions of this section must limit the side lobe antenna gain to -10 dBi for off-axis angles from the main beam of greater than 60 degrees.

(j) Measurement Procedures

- (1) Radiated measurements of the fundamental emission bandwidth and power shall be made with maximum main beam coupling between the LPR and test antennas (boresight).

- (2) Measurements of the unwanted emissions radiating from an LPR shall be made utilizing elevation and azimuth scans to determine the location at which the emissions are maximized.
- (3) All emissions at and below 960 MHz are based on measurements employing a CISPR quasi-peak detector.
- (4) The fundamental emission bandwidth measurement shall be made using a peak detector with a resolution bandwidth of 1 MHz and a video bandwidth of at least 3 MHz.
- (5) The provisions in §15.35(b) and (c) of this part that require emissions to be averaged over a 100 millisecond period and that limits the peak power to 20 dB above the average limit do not apply to devices operating under this section.
- (6) Compliance measurements of frequency-agile LPR devices shall be performed with any related frequency sweep, step, or hop function activated.
- (7) Compliance measurements shall be made in accordance with the specific procedures published or otherwise authorized by the Commission.

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